

# **DOCUMENTED RELEASE SAMPLING REPORT**

**FOR**

**JOHNNY M URANIUM MINE  
GRANTS LEGACY URANIUM SITES  
GRANTS, MCKINLEY COUNTY, NEW MEXICO**

Prepared for

**U.S. Environmental Protection Agency Region 6**

Linda Carter, Project Officer  
1445 Ross Avenue  
Dallas, Texas 75202

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EPA SAM: Lisa Price

START-3 PTL: Patrick Buster

Prepared by

**Weston Solutions, Inc.**

Robert Beck, VP, P.E., Program Manager  
70 NE Loop 410, Suite 600  
San Antonio, Texas 78216  
(210) 308-4300

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## EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) tasked Weston Solutions, Inc. (WESTON®), the EPA Region 6 Superfund Technical Assessment and Response Team (START-3) contractor, to conduct Documented Release Sampling (DRS) at the Johnny M Uranium Mine located near San Mateo, McKinley County, New Mexico.

The Johnny M Uranium Mine was identified as a potential hazardous waste site and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) under CERCLIS No. NMN0006607139. On 8 October 2009, the EPA conducted an Airborne Spectral Photometric Environmental Collection Technology (ASPECT) overflight of the San Mateo area and collected measurements for exposure rate, total count rate, and elemental uranium. Results from the ASPECT overflight indicated elevated radiation exposure rates and gamma radiation activity (total count rate). Figure 1-2 presents the ASPECT overflight exposure rate results. The ASPECT overflight results also indicated that elemental uranium was detected at concentrations that were greater than 45 picocuries per gram (pCi/g).

START-3 conducted DRS at the Johnny M Mine Site on 28 and 29 January 2012 that included collecting surface gamma radiation measurements in addition to conducting sampling and performing chemical/radiological analyses of surface soil. The specific sampling objectives for the DRS were to collect data that could be used to document a potential release of hazardous substances to the environment and to potentially warrant further site investigation and/or reclamation. Based on the results of the DRS sampling event, soil contamination attributable to the Johnny M Uranium Mine was documented via these contributing factors:

- Eighty-three out of the 99 stationary 1-minute gamma measurement locations had readings higher than two times the mean background average reading of 11,720 cpm, indicating a documented release at the Johnny M Uranium Mine.
- Ra-226 soil sampling results from the Johnny M Uranium Mine ranged from 2.64 to 317 pCi/g. All eleven sample results significantly exceeded three times the background Ra-226 result average of 2.69 pCi/g for the mine. This indicates a documented release at the Johnny M Uranium Mine.

- Arsenic, barium, cadmium, molybdenum, selenium, uranium, vanadium and zinc were detected in soil samples that exceeded three times background concentrations, indicating a documented release at the Johnny M Uranium Mine.

START-3 has prepared this Documented Release Sampling Report to describe the technical scope of work that was completed as part of the Technical Direction Document (TDD) No. TO-0035-11-11-01 under Contract No. EP-W-06-042 for EPA Region 6. The EPA Site Assessment Manager (SAM) was Lisa Price, and the START-3 Project Team Leader (PTL) was Patrick Buster.

- ☐ The EPA Task Monitor did not provide final approval of this report prior to the completion date of the work assignment. Therefore, Weston Solutions, Inc. has submitted this report absent the Task Monitor's approval.
- ☐ The EPA Task Monitor has provided final approval of this report. Therefore, Weston Solutions, Inc. has submitted this report with the Task Monitor's approval.

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**\*All tables are provided as separate portable document format (PDF) files.**

# 1. INTRODUCTION

WESTON, the EPA Region 6 START-3 Contractor, was tasked by EPA under Contract Number EP-W-06-042, TDD No. TO-0035-11-11-01 and Amendment A (Appendix G) to conduct Documented Release Sampling (DRS) at the Johnny M Uranium Mine located in McKinley County, New Mexico. Site coordinates are Latitude 35.362134° North and Longitude 107.724344° West. A Site Location Map is provided as Figure 1-1. All figures and tables are provided as separate portable document format (PDF) files. START-3 has prepared this DRS Report to provide the EPA with the field radiation scanning results and present the analytical data obtained during the field investigation performed at the Johnny M Uranium Mine.

## 1.1 SITE BACKGROUND

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), WESTON was tasked to perform DRS at the Johnny M Uranium Mine (“the Site”) located near San Mateo, McKinley County, New Mexico.

The Johnny M Uranium Mine was identified as a potential hazardous waste site and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) under CERCLIS No. NMN0006607139. On 8 October 2009, the EPA conducted an Airborne Spectral Photometric Environmental Collection Technology (ASPECT) overflight of the San Mateo area and collected measurements for exposure rate, total count rate, and elemental uranium. Results from the ASPECT overflight indicated elevated radiation exposure rates and gamma radiation activity (total count rate). Figure 1-2 presents the ASPECT overflight exposure rate results. The ASPECT overflight results also indicated that elemental uranium was detected at concentrations that were in excess of 45 picocuries per gram (pCi/g). Additionally, according to the New Mexico Environment Department (NMED) Ground Water Quality Bureau Pre-CERLCIS Screening Assessment of the Johnny M Mine, issued August 2010, the last documented site reconnaissance occurred in July 2010 by the New Mexico Energy, Minerals and Natural Resources Department (NMEMRD).

START-3 has prepared this report to provide available background information collected for the Johnny M Uranium Mine, discuss the DRS activities, and present the analytical data obtained as part of the investigation.

## 1.2 OBJECTIVES OF THE INVESTIGATION

After reviewing the NMED memorandum and reviewing the results obtained from the ASPECT overflight, the EPA concluded that an investigation was needed to determine if hazardous substances have been released to the environment from past historical mining activities and despite reclamation histories. This investigation is designed to provide a high-confidence determination by direct observation, field measurement, and laboratory analysis that a hazardous substance has been released at the mine site, termed a “documented release.” The definition of a release under CERCLA (Section 101(22)) is *“[A]ny spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant)...”* For the purpose of this investigation, a documented release can be established by chemical analysis which requires attributing the hazardous substance to the site, determining background, demonstrating that the concentration of the hazardous substance in a release sample is significantly increased above background, and attributing some portion of the significant increase to the site. EPA will use this information obtained during the DRS to determine if additional investigation and/or reclamation is warranted and to prioritize those actions for all uranium mines in the Grants Mining District.

## 1.3 SCOPE OF WORK

The DRS Scope of Work is intended to describe the tasks requiring completion in order to evaluate the Johnny M Uranium Mine. As part of this DRS, START-3 performed the following major tasks:

- Prepared a site-specific Quality Assurance Sampling Plan (QASP), approved by the EPA, and Health and Safety Plan (HASP) prior to sampling activities.
- Evaluated the available information from the on-site observations, historical aerial photographs, area environmental information, and historical documents provided by the EPA.



- Conducted DRS field sampling/scanning activities on 28 and 29 January 2012. Samples were collected at various locations with the highest 1-minute stationary gamma measurements. The samples were collected in general accordance with the site-specific QASP and HASP to document the presence and migration of hazardous substances attributable to the Site.
- Submitted the DRS samples to National Environmental Laboratory Accreditation Program (NELAP) certified laboratories for analysis and reviewed and tabulated the resulting data.
- Compared the laboratory results to three times the background concentrations to establish a documented release.
- Prepared this report to present the findings of the DRS.

## 1.4 REPORT FORMAT

The DRS report contains the following sections:

- Section 1 – Introduction
- Section 2 – Site Characteristics
- Section 3 – Documented Release Sampling
- Section 4 – Summary
- Section 5 – References

Additional information is provided in the following appendices:

- Appendix A Digital Photographs
- Appendix B START-3 Site Logbook
- Appendix C START-3 Quality Assurance Sampling Plan
- Appendix D Laboratory Data Packages
- Appendix E Laboratory Data Validation Packages
- Appendix F Reference Documentation
- Appendix G TDD No. 0035-11-11-01 and Amendment A

Tables and figures cited in this report are provided as separate PDF files. Photographs taken during the DRS activities are provided as Appendix A. The START-3 field logbook notes are provided as Appendix B. The site-specific QASP is provided as Appendix C.

## **2. SITE CHARACTERISTICS**

Information regarding the site location, description, and site history is included in the following subsections.

### **2.1 SITE LOCATION AND DESCRIPTION**

The Johnny M Uranium Mine is within the Ambrosia Lake Mining District, located 17 miles north-northwest of Grants and five miles north-northwest of San Mateo in McKinley County, New Mexico. The reclaimed area of the Johnny M Mine Site is approximately 65 acres in size. The Johnny M Uranium Mine can be reached from Grants, New Mexico via Highway 605 north for 16.5 miles, then turning north onto a private gravel road for 0.5 miles until a locked gate is reached at the entrance to the Site.

### **2.2 SITE HISTORY**

The Johnny M Mine was operated by Ranchers Exploration and Development Corporation (predecessor to Hecla Limited) from early 1972 to early 1982. The mining operations initially included the mining of uranium ore from approximately 900 below ground surface followed by mining from approximately 1200 feet below ground surface. To access the ore body, ground water was discharged from the mine at a rate of approximately one million gallons per day and discharged ultimately to an outfall in San Mateo Creek. Two surface impoundments were created to treat the mine water discharge beginning in 1978 to meet New Mexico water quality criteria; the impoundments were approximately 100x400x15 feet each and were located just south of the mine operation (Figure 2-1). In order to prevent the collapse of the mining workings as further underground mining continued, Ranchers Exploration and Development Corporation slurried uranium mill tailings obtained from the Kerr-McGee Mill (now known as the Rio Algom Mill) as structural sand support in the stopes. Two surface locations were used for storage of the uranium tailings prior to injection in the mine stopes. According to New Mexico records, these two areas covered approximately one acre at the north and one acre at the south injection site. An estimated 286,000 tons of tailings were injected into the mine. Injection depths range from 1,134

feet to 1,148 feet and from 1,162 feet to 1,183 feet below the surface (using the shaft for datum), or about 1,100 to 1,300 feet underground, depending on the terrain.

Reclamation of the mine property began in early 1982. The mine shaft was sealed with a 4-foot-thick water ring reinforced concrete plug set between the Dakota and the Westwater members of the formation. The portal was sealed with a 12-inch-thick reinforced concrete plug, and a 20-inch-diameter capped, steel pipe was set in the concrete. The surface was then covered with earthen materials during site recontouring. The location of the shaft is not presently obvious due to the revegetated surface (Reference 1).

### 3. DOCUMENTED RELEASE SAMPLING

The specific information regarding field observations, sampling activities, background determination, gamma scanning and measurements, soil sampling, and deviations from the QASP are included in the following subsections (Reference 2).

#### 3.1 OVERVIEW

START-3 was tasked to conduct DRS of the Johnny M Uranium Mine, including collecting environmental samples, gamma scanning approximately 10% of the Site, and collecting 100 stationary 1-minute gamma measurements. The specific sampling objectives were to collect data that could be used to document a release of hazardous substances to the environment as a result of historical mining operations. The Contaminants of Concern (CoCs) include all identifiable gamma emitting radioisotopes, specifically the daughters of uranium-238 (U-238) and radium-226 (Ra-226). Additional CoCs include arsenic, molybdenum, selenium, and total uranium.

START-3 implemented the QASP at the Johnny M Uranium Mine Site on 28 and 29 January 2012. START-3 collected gamma measurements sufficient to provide approximately 10% coverage of the surface area of the Site. Figure 3-1 illustrates the assessment area. Mine area gamma radiation distribution results are presented in Table 3-1. In addition, 1-minute stationary gamma measurements were collected at 99 evenly spaced grid locations throughout the mine area. The stationary gamma measurements are listed in Table 3-2 and the locations are presented on Figure 3-2. In addition, 10 soil samples and 1 duplicate soil sample were collected at the 1-minute stationary locations that had elevated gamma activity. Sample locations are illustrated on Figure 3-2. Two background soil samples (Figure 3-1) were collected to the northeast and northwest beyond the perimeter of the mine area, and 1-minute stationary readings were collected at each location. The locations of the background samples are presented on Figure 3-1, and the 1-minute gamma measurements are listed in Table 3-2.

Surface soil samples were collected and submitted to a National Environmental Laboratory Accreditation Program (NELAP) certified laboratory for the following analyses: total metals including arsenic, molybdenum, selenium, and total uranium by Methods SW846 6010/6020 and

7470/7471, and all identifiable gamma emitting radioisotopes by Method LANL ER-0130 gamma spectrometry. The analytical data were validated by START-3. Laboratory analytical results for radioisotopes and metals are presented in Tables 3-3 and 3-4, respectively. The laboratory data packages are included in Appendix D. The validated laboratory data packages are included in Appendix E.

### **3.2 FIELD OBSERVATIONS**

The site reconnaissance took place on 28 and 29 January 2012. The weather was sunny, with a high temperature of 40 degrees Fahrenheit and light winds. The mine area was generally flat despite multiple deep ravines in the arroyo area, and was fairly uniformly covered in desert grass vegetation and shrubs, although grass/shrub density varied depending on location. During the site reconnaissance, it was noted that the surface of the mine area mostly consisted of a gray soil, which appeared to be some type of fill and/or capping material. The site had significant snow cover accumulation, and in the late afternoon became very muddy and wet. Gamma readings around the grayish colored fill were significantly more elevated than on other areas of the Site.

### **3.3 BACKGROUND DETERMINATION**

The START-3 QASP (Reference 2) protocol determines the background for the individual site as the mean of the field measurements and laboratory results of samples collected from four locations at the perimeter of the property. These four sample locations correspond to the four cardinal directions of the compass (north, east, south, and west). The protocol indicates that a site background location should have similar physical, chemical, geological, radiological, and biological characteristics of the legacy mine site if there are no impacts from uranium mining and milling at the Site. START-3 collected two background soil samples to the northeast and northwest of the Johnny M Uranium Mine, where 1-minute stationary gamma measurements were also collected. It was determined that a representative background sample could not be collected south of the Johnny M Uranium Mine, as the area appeared disturbed and was deemed an unsuitable background sample location.

### **3.4 GAMMA SCANNING**

Due to the size of the Johnny M Uranium Mine, it was determined that approximately 10% of the surface area would be scanned using a 2X2 NaI detector held approximately 1 meter above the ground surface in conjunction with a Global Positioning System (GPS) unit. Although the reclaimed area of the Johnny M Uranium Mine is approximately 65 acres, only 31 acres of the primary historical mining area was assessed. Evenly placed transects were walked across the mine site from one end of the disturbed claim boundary to another. Each transect was approximately 10 meters apart. One-second measurements of gamma activity were recorded and electronically attached to the appropriate GPS designation for the subsequent plotting and depiction of the ambient gamma activity. A total of 11,172 gamma radiation measurements were collected from the mine-site, ranging from 9,261 cpm to 665,629 cpm. Johnny M Uranium Mine gamma radiation results and statistics are provided in Table 3-1 and on Figure 3-1.

### **3.5 STATIONARY GAMMA MEASUREMENTS**

Stationary 1-minute gamma measurements were collected at 99 10-meter evenly spaced grid locations across the Johnny M Uranium Mine, using the same type of instrumentation and at the same height above the ground surface as the gamma scanning measurements. Because the stationary measurements are integrated over 1-minute intervals versus 1-second intervals, the measurements provide a more accurate measurement of the ambient gamma activity at that point. The QASP protocol states that a single-point measurement greater than two times the background average concentration indicates a documented release at the mine (Reference 2). At the 99 total stationary locations, gamma measurements ranged from 6,288 cpm to 381,092 cpm, with 83 measurements exceeding two times the background average measurement of 11,720 cpm. The stationary measurement locations and measurements are illustrated in Figure 3-2 and presented in Table 3-2.

### **3.6 SOIL SAMPLING**

START-3 collected 10 soil samples (including 2 background and 1 duplicate sample) at 0 to 6-inch depths at locations identified by the stationary measurements as being suspect. Figure 3-2 depicts the sampling locations, and Table 3-2 presents the 1-minute stationary gamma

measurements at each sample location. Surface soil samples were collected and submitted for total metals including total uranium, molybdenum, tin, and mercury by Methods SW846 6010/6020 and 7470/7471, and all identifiable gamma emitting radioisotopes by Method LANL ER-0130 Gamma Spectrometry. The QASP states that if any sample contains U-238 as determined by alpha spectrometry or Ra-226 as determined by gamma spectrometry at a concentration equal to or greater than three times the mean background average concentration, the Site will be identified as having a documented release (Reference 2). All 11 soil samples from the Johnny M Uranium Mine exceeded three times the background average concentration for Ra-226. The analytical data were validated by START-3. The metals and radioisotopes laboratory results are included in Tables 3-3 and 3-4. Laboratory data are presented in Appendix D, and the validated laboratory data packages are included in Appendix E.

### **3.7 DEVIATIONS FROM THE QASP**

The following deviation from the QASP occurred during the field work:

- A suitable background sampling location on the southern side of the Site was not located due to the topography and disturbed nature of the site. Background locations should have similar physical, chemical, geological, radiological, and biological characteristics as the legacy mine site.
- Only 99 of the 100 stationary measurements were collected. One of the locations was omitted due to very deep snow levels.

## 4. SUMMARY

START-3 conducted DRS at the Johnny M Mine Site on 28 and 29 January 2012 that included collecting surface gamma radiation measurements, in addition to conducting sampling and performing chemical/radiological analyses of surface soil. The specific sampling objectives for the DRS were to collect data that could be used to document a potential release of hazardous substances to the environment and to potentially warrant further site investigation and/or reclamation. Based on the results of the DRS sampling event, soil contamination attributable to the Johnny M Uranium Mine was documented via these contributing factors:

- Eighty-three out of the 99 stationary 1-minute gamma measurement locations had readings higher than two times the mean background average of 11,720 cpm, indicating a documented release at the Johnny M Uranium Mine.
- Ra-226 soil sampling results for the Johnny M Uranium Mine ranged from 2.64 to 317 pCi/g. All eleven soil sample results significantly exceeded three times the background Ra-226 result average of 2.69 pCi/g. This indicates a documented release at the Johnny M Uranium Mine.
- Arsenic, barium, calcium, molybdenum, selenium, sodium, uranium, vanadium and zinc were detected in soil samples that exceeded three times the background concentrations, indicating a documented release at the Johnny M Uranium Mine.



## 5. REFERENCES

1. URFO (Uranium Recovery Field Office). Termination Of The Source Material License Issued To Hecla Mining Company For The Johnny M Mine, San Mateo, New Mexico. 21 December 1990.
2. Weston Solutions, Inc. Quality Assurance Sampling Plan for the Johnny M Uranium Mine, Grants, McKinley County, New Mexico. December 2011.